

WHAT IS CLAIMED IS:

1           1. A device for implanting autologous vascular  
2 smooth muscle cells transduced with a gene of interest in a  
3 patient, comprising:

4           a tubular elongate member having a wall, which wall  
5 has an interior surface, an exterior surface, and pores  
6 therein;

7           the autologous smooth muscle cells transduced with  
8 the gene of interest immobilized within the pores and upon the  
9 interior surface of the wall to form a tubular smooth muscle  
10 cell complex having an interior surface; and

11          autologous vascular endothelial cells adherent to  
12 the interior surface of the tubular smooth muscle cell  
13 complex.

1           2. A device as in claim 1, wherein the tubular  
2 elongate member is comprised of a porous synthetic material.

1           3. A device as in claim 2, wherein the porous  
2 synthetic material is polytetrafluoroethylene (PTFE), dacron  
3 or nylon.

1           4. A device as in claim 3, wherein the tubular  
2 elongate member is a vascular graft.

1           5. A device as in claim 1, wherein the autologous  
2 vascular smooth muscle cells are transduced with a gene  
3 encoding erythropoietin.

1           6. A device as in claim 1, wherein the vascular  
2 smooth muscle cells are transduced with a gene encoding  
3 granulocyte colony stimulating factor or granulocyte  
4 macrophage colony stimulating factor.

1           7. A device as in claim 1, wherein the vascular  
2 smooth muscle cells are transduced with a gene encoding Factor  
3 IX.

1           8. A device as in claim 1, wherein the transduced  
2 cells constitutively express an anticoagulant.

1           9. A device as in claim 1, wherein the transduced  
2 autologous vascular smooth muscle cells are immobilized to the  
3 tubular elongate member with a polymer.

1           10. A device as in claim 9, wherein the polymer is  
2 collagen or fibronectin.

1           11. A method for introducing a gene of interest to  
2 a patient comprising:  
3           engrafting a device as in claim 1 into the patient's  
4 vascular system, wherein the transduced vascular smooth muscle  
5 cells contain the gene operably linked to a promoter for  
6 expression.

1           12. A method as in claim 11, wherein the gene  
2 encodes erythropoietin, granulocyte colony stimulating factor,  
3 granulocyte macrophage colony stimulating factor, or Factor  
4 IX.

1           13. A method as in claim 11, wherein the device is  
2 engrafted into the patient's arterial system.

1           14. A method for treating anemia in a patient,  
2 comprising engrafting a device as in claim 1 into the  
3 patient's vascular system, wherein the transduced autologous  
4 smooth muscle cells express erythropoietin.

1           15. The method of claim 14, wherein the device is  
2 engrafted into the patient's arterial system.

1           16. A method for treating an occlusion of a blood  
2 vessel in a patient, comprising engrafting a device as in  
3 claim 1 into the occluded blood vessel bypassing the  
4 occlusion, wherein the transduced cells constitutively express  
5 an anticoagulant protein.

1           17. A method as in claim 16, wherein the  
2           anticoagulant is a plasminogen activator or antithrombin-III.

1           18. A method as in claim 17, wherein the  
2           plasminogen activator is alteplase or urokinase.

1           19. A method for treating or preventing diabetes in  
2           a patient, comprising engrafting a device as in claim 1 into  
3           the patient, wherein the transduced cells constitutively  
4           express an insulin or proinsulin polypeptide.

1           20. A method for treating or preventing a disease  
2           in a mammal, comprising:

3                 removing vascular endothelial cells and vascular  
4                 smooth muscle cells from the mammal;

5                 transducing the smooth muscle cells with a gene  
6                 which encodes a product for treating or preventing the  
7                 disease, operably linked to a promoter;

8                 immobilizing on a tubular elongate porous vascular  
9                 graft device the transduced smooth muscle cells within the  
10                pores and interior surface of the graft;

11                coating the interior of the graft device having  
12                immobilized thereon the transduced smooth muscle cells with  
13                the endothelial cells; and

14                engrafting the device having the immobilized  
15                transduced smooth muscle cells and endothelial cells into the  
16                vasculature of the mammal to treat or prevent the disease.

1           21. The method of claim 20, further comprising the  
2           step of cultivating the vascular smooth muscle cells obtained  
3           from the mammal in a medium containing autologous serum prior  
4           to immobilizing the cells on the vascular graft.

1           22. The method of claim 21, further comprising the  
2           step of cultivating the vascular endothelial cells obtained in  
3           a medium containing autologous serum prior to coating the  
4           vascular graft.